Students Lack Computer Competence, Report Says

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school knowing about computers, what they can do, how to operate them, and how to program them," he said. "Currently, there isn't any consensus on these matters."

Harold Goldstein, a consultant to the National Institute for Work and Learning, a research group based here, said he did not view students' poor performance on the assessment as alarming.

A survey he conducted in 1985 found that more than 85 percent of workers who used computers had learned all they needed to know on the job.

"I'm not sure that training given in a general way, well in advance of actually using computers, is effective," said Mr. Goldstein, a former assistant U.S. commissioner of labor statistics. "A student may forget a lot of what he learned."

But Marc S. Tucker, president of the National Center on Education and the Economy, a Rochester, N.Y., research institute, said computer knowledge is essential for all students, regardless of the type of work they eventually do.

"If you view the computer as the most powerful intellectual assistant ever created," he said, "and assume that schools are giving kids the opportunity to gain some real skill in using this remarkable tool, then you are in for a disappointment" with the NAEP results.

The NAEP report is based on a paper-and-pencil test administered in 1986 to about 24,000 students in the 3rd, 7th, and 11th grades. The agency had planned to include questions involving actual computer use, Mr. Lapointe said, but the cost of providing enough computers proved prohibitive.

Nevertheless, he said, NAEP officials are confident about the reliability of the results. "Anyone who uses a computer would be able to answer the questions well," he said.

NAEP is a federally funded, Congressionally mandated project that tests students in reading, writing, mathematics, and other subjects every two years. It is administered by the Educational Testing Service under a contract with the Education Department.

Computer Applications

The assessment found that students performed poorly on questions about computer applications, including word processing, graphics, and the use of databases and spreadsheets.

While most 11th graders were able to identify word-processing functions—such as "search and replace," "insert," and "delete"—students in all grades "appear to have had difficulty in most categories," the report states.

On questions involving the use of databases to sort information, for example, 3rd graders averaged 30 percent correct, 7th graders averaged 44 percent, and 11th graders averaged 53 percent.

Students performed even less well on programming questions, in large part because they had had little experience in that skill, the report says. Students answered between 20 percent and 30 percent of the programming questions correctly, but two-thirds of those tested reported that they had never written a program.

On the other hand, the report notes, most students showed "some familiarity" with computers and had "some practical knowledge" about them. A majority of 7th and 11th graders, for example, could distinguish between hardware and software, and many students in all grades could identify the basic units of a computer.

Learning at Home

Students' performance on the assessment was closely related to their experience with computers, the study found.

"The relationship is both expected and reassuring: Students who take courses in computers are likely to be more computer-competent than those who do not," the report says.

However, it notes, students seldom use computers in subjects other than computing, and their use in most other subjects tends to decline over time.

For example, it says, while 53 percent of 3rd graders had used computers in mathematics classes, only 39 percent of 7th graders and 29 percent of 11th graders had done so.

The study also found that students who reported having computers at home—30 percent of all those tested—tended to perform better on the assessment than those who did not. Those with computers at home who also received instruction in computing in school performed best of all.

Moreover, the report notes, many of those with home computers said they had learned more about them at home than at school.

These findings suggest that schools may not be offsetting the advantages of children from affluent families—typically white—that can afford to own computers, noted Gregory R. Anrig, president of the E.T.S.

"This poses a special challenge to schools that serve minority youngsters," he said. "They have to overcome the advantages other students have. This can be done, and it ought to be done."

In addition to gaps in computer access between whites and minorities, the study found that male students were more likely than female students to have computers at home.

'Caught in a Storm'

The researchers also surveyed school "computer coordinators"—faculty members responsible for computer studies at the assessment sites. Many of those who completed a NAEP questionnaire expressed some doubts about their own qualifications in the field.

Only a small percentage of the respondents reported having majored or minored in computer science in college, the report says. But it also notes that "until recently, few universities offered degrees in computer science and that more than 80 percent of computer coordinators were over the age of 30."

Despite that lack of formal preparation, about two-thirds of the 3rd- and 7th-grade coordinators, and some 85 percent of the 11th-grade coordinators, rated themselves "very good" or "good" at using a computer.

But a third of the 3rd-grade coordinators, a fourth of the 7th-grade coordinators, and a 10th of those responsible for the 11th grade said they were inadequately prepared to teach the subject.

Many were not actually teaching computing classes at the time of the survey, the report notes.

"The computer age has, in a sense, taken the American educational system by storm," it concludes. "Many teachers, caught in that storm, found themselves inadequately prepared for the teaching about computers."

Copies of the report, "Computer Competence, the First National Assessment," can be ordered for $14 each, with a 50 percent discount for orders of three or more, from the National Assessment of Educational Progress, P.O. Box 6710, Princeton, N.J. 08541-6710.

Computer Use in Subject Areas*

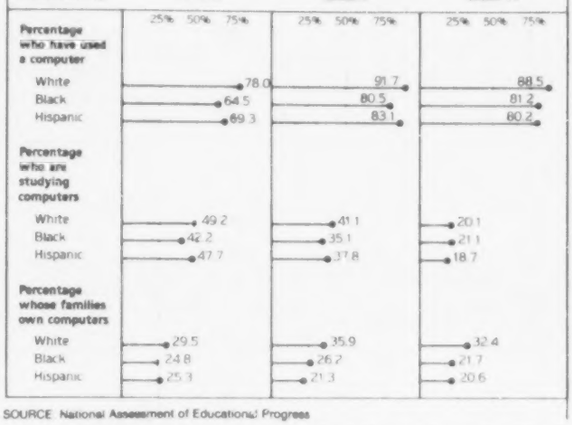
Have you used a computer in any of the following classes?	Grade 3	Grade 7	Grade 11
Math	53.0%	39.4%	29.1%
Reading/English	25.0	23.9	16.9
Science	12.8	11.6	15.4
Social Studies	11.7	10.2	4.6
Art	21.6	7.3	3.2
Music	16.9	7.0	3.9

*Column percentages may add up to more than 100% because multiple responses were possible.

Experience with Computers, by Type of School

School	Grade 3	Grade 7	Grade 11
Percentage who have used a computer			
Public	74.5	88.7	85.7
Non-public	78.4	91.4	88.3
Percentage who are studying computers			
Public	47.2	36.3	20.4
Non-public	54.8	51.8	21.9
Percentage whose families own computers			
Public	28.1	31.2	28.8
Non-public	33.4	45.5	43.6

Racial/Ethnic Differences in Experience with Computers



SOURCE: National Assessment of Educational Progress

Frequency of Computer Application Use

How often do you use a computer to:	Frequency: Almost Every Day	Several Times a Week	About Once a Week	Less than Once a Week	Never
		Grade 7			
Write Letters, Stories, Reports	3.4%	6.9%	12.5%	27.0%	50.2%
Make Graphs	2.2	3.5	6.5	14.8	73.0
Make a Database	1.5	2.4	4.1	7.5	84.6
		Grade 11			
Write Letters, Stories, Reports	4.4%	6.1%	8.5%	27.4%	53.5%
Make Graphs	1.4	2.0	4.3	13.3	78.9
Make a Database	2.2	3.4	3.3	8.5	82.7

Frequency of Computer Use in Subject Areas

How often do you use a computer to:	Almost Every Day	Several Times a Week	About Once a Week	Less than Once a Week	Never
		Frequency — Grade 7			
Practice Math	5.7%	4.7%	9.8%	17.5%	62.3%
Practice Reading	3.1	3.8	5.9	8.8	78.4
Practice Spelling	2.8	3.3	7.8	10.0	76.1
Do Science Problems	1.9	2.9	3.1	6.8	85.3
Learn and Make Music	2.4	3.0	6.2	10.3	78.1
Play Games	19.4	15.4	16.3	24.6	24.3
		Frequency — Grade 11			
Practice Math	3.4%	3.0%	3.6%	12.1%	77.9%
Practice Reading	1.8	2.1	2.0	6.9	87.2
Practice Spelling	1.4	1.6	2.8	6.7	87.5
Do Science Problems	0.8	1.5	1.9	8.6	87.2
Learn and Make Music	1.4	1.7	2.2	9.0	85.6
Play Games	8.5	9.8	14.0	33.9	33.8

Sample Spreadsheet Questions

Pat has constructed the following spreadsheet to calculate the cost of supplies for a lemonade stand open from May through August.

	A	B	C	D	E	F	G
1							
2			COST OF LEMONADE INGREDIENTS				
3							
4			May	June	July	Aug	
5							
6	Sugar		$ 9.00				
7	Lemons		$12.00				
8	Bottled Water		$ 8.00				
9							
10	TOTAL BY MONTH		$29.00				

What should Pat do to calculate the total cost of lemons for all four months?

- ○ Calculate the average of cells C6 through F6
- ○ Calculate the average of cells C7 through F7
- ○ Calculate the sum of cells C6 through F6
- ● Calculate the sum of cells C7 through F7

Percent Correct
Grade 11
41.1

Computers Tallied By Census Bureau

A new U.S. Census Bureau study, based on four-year-old data, indicates more than a quarter of the nation's 45.6 million students used computers at school.

Private researchers have performed more up-to-date studies, but "Computer Use in the United States: 1984" is the first such document published by the federal government.

Copies of study—Series P-23, No. 155—can be ordered from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.